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Pesticide Fact Sheet Number 142: Fenitrothion

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16. Abstract (Limit: 200 words)

This document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on a specific pesticide or group of pesticides. A Fact Sheet is issued after one of the the following actions has occurred.

1. Issuance or reissuance of a registration standard,
2. Issuance of each special review document,
3. Registration of a significantly changed use pattern,
4. Registration of a new chemical, or
5. An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

17. Document Analysis a. Descriptors

Pesticides, regulations, Chemical Information Fact Sheet, Use Patterns, science findings.

b. Identifiers/Open-Ended Terms

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Office of Pesticides and Toxic Substances
Office of Pesticide Programs (TS-766C)
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EPA

Pesticide Fact Sheet

Name of Chemical: FENITROTHION
Reason for Issuance: REGISTRATION STANDARD
Date Issued: July 30, 1987
Fact Sheet Number: 142

1. DESCRIPTION OF CHEMICAL

Generic Name (Chemical): 0,0-dimethyl 0-(4-nitro-m-tolyl) phosphorothioate
Common Name: Fenitrothion
Other Chemical Nomenclature: 0,0-dimethyl 0-(3-methyl-4-nitrophenyl) phosphorothioate; 0,0-dimethyl 0-(4-nitro-m-tolyl) phosphorothioate
Trade Names: Bayer 41831; Bayer S-5660; Bayer S-1102A; AC-47,300; C 47114; Accothion; Cytel; Cyfen; Folithion; Sumithion; Agrothion; Dicofen: Fenstan; Metathion E-50; Verthion; Cekutrothion; Dybar; Fenitox; Novathion; and Nuvanol.
EPA Shaughnessy Code: 105901
Chemical Abstracts Service (CAS) Number: 122-14-5
Year of Initial Registration: 1975
Pesticide Type: Insecticide/Acaricide
Chemical Family: Organophosphate
U.S. and Foreign Producers: Sumitomo Chemical Company (Japan)

2. USE PATTERNS AND FORMULATIONS

Application Sites: Ornamentals (including outdoor, greenhouse, and nursery); in forests for spruce budworm and southern pine beetle control; and in and around non-food domestic, commercial, institutional and industrial areas for household pest control.
Formulation Types: 40% wettable powder (for control of adult anopheline mosquitoes in human dwellings), 4 (45.5%) and 8 (76.8%) pound per gallon emulsifiable concentrates (forestry, ornamental and domestic, commercial, institutional and industrial use), and a 93% soluble concentrate/liquid (forestry use).
Application Methods: Primarily by ground application equipment; aerial equipment is used for spruce budworm control.

3. SCIENCE FINDINGS

Summary Science Statement

Fenitrothion is a moderately acutely toxic cholinesteraseinhibiting pesticide. It is in Toxicity Category II for the oral and dermal routes of exposure and Toxicity Category III for the inhalation route of exposure and is mildly irritating to the eyes and skin (Toxicity Category III). It has not been shown to be a dermal sensitizer and does not demonstrate acute delayed neuotoxic effects. Substantial chronic toxicology and residue chemistry data gaps exist, including metabolism, oncogenicity, mutagenicity, teratogenicity, and reproductive effects. Human epidemiological evidence and a dog chronic feeding study have implicated fenitrothion in causing human eye effects, such as retinal degeneration and myopia. Laboratory data show that fenitrothion is potentially highly to very highly toxic to birds, fish, and aquatic invertebrates, including certain endangered species. Preliminary data indicate that groundwater contamination probably is not a potential threat; however the Agency is unable to conduct a full assessment due to data gaps. The Agency is particularly concerned with potential exposure to applicators using ground application techniques to control southern pine beetles; reentry workers in greenhouses and nurseries; and non-target organisms following forestry uses.

Chemical/Physical Characteristics of the Technical Material

Physical State: oily liquid
Color: Yellow-brownish
Molecular weight and formula: 277.2 - $C_9H_{12}NO_5PS$
Boiling Point: 118 °C at 0.01 mm Hg
Melting Point: 0.3 °C
Specific Gravity: 1.32- 1.34
Vapor Pressure: data gap
Solubility in various solvents: data gap
pH: data gap
Stability: data gap

Toxicology Characteristics (Technical Grade)

Acute Oral: Toxicity Category II (800 and 330 mg/kg in male and female rats, respectively)
Acute Dermal: Toxicity Category II (1200 and 890 mg/kg in female and male rats, respectively)
Acute Inhalation: Toxicity Category III (5.0 mg/L in rats)
Primary Dermal Irritation: Toxicity Category III; mild dermal irritation was reported in a rabbit study.

Primary Eye Irritation: Toxicity Category III; mild irritation after a single application of 0.1 mL into unwashed eyes of albino rabbits.
Skin Sensitization: Not a skin sensitizer
Delayed neurotoxicity: Negative in the hen.
Subchronic Oral (rodent) Testing: Data gap for rodent species (for plasma cholinesterase effects)
Oncogenicity: Data gap for the mouse
Chronic Feeding: NOEL for brain and red blood cell cholinesterase in rats is 10 ppm; systemic NOEL for plasma inhibition in the dog is 5 ppm.
Metabolism: Data gap
Teratogenicity: Data gap
Reproduction: Data gap
Mutagenicity: Data gap for point mutation assay in mammalian cells, structural chromosomal aberration, and other genotoxic effects
Major routes of exposure: Inhalation and dermal exposure to occupants of treated dwellings; dermal and respiratory exposure to applicators and reentry workers.

Environmental Characteristics
Data gaps exist for most studies. Preliminary data indicate that fenitrothion degrades fairly rapidly in soil with a half-life of less than a week in non-sterile muck and sandy loam soils. Preliminary data also suggest fenitrothion is intermediately mobile in a variety of soils ranging in texture from sandy loam to clay. The potential for groundwater cannot be assessed until acceptable environmental fate data are received.

Ecological Characteristics (technical grade)
Avian oral toxicity: highly toxic to upland gamebirds and slightly toxic to waterfowl (acute oral toxicity value to bobwhite quails and mallards was determined to be 23.6 mg/kg and 1190, respectively)

Avian dietary toxicity (8 day): highly toxic to upland gamebirds and and slightly toxic to waterfowl (subacute toxicity value of 157 ppm for bobwhite quail and 2482 ppm for mallards.)

Freshwater fish acute toxicity (96 hr. LC_{50}): moderately toxic to both warmwater and coldwater fish (1.7 ppm for brook trout; 3.8 ppm for bluegill)

Freshwater invertebrate toxicity: (48 hr. or 96 hr. EC_{50})	very highly toxic to aquatic invertebrates (3 ppb for Gammarus fasciatus)

Tolerance Reassessment

There are no domestic uses for fenitrothion on food or feed commodities. There is one established U.S. food additive tolerance which covers residues of fenitrothion in wheat gluten imported from Australia arising from the stored wheat grain treatment registered in that country (2 CFR 193.156[9]). The nature of fenitrothion residues in plants is adequately understood. Submitted data indicate that fenitrothion per se (I), desmethyl fenitrothion (IV), and p-nitrocresol (VII) are the major components of the residue. Animal metabolism studies are not available. In the event that future federal registrations for use of fenitrothion on plant commodities used for animal feeds are established, or regulations covering importation of animal products from countries in which fenitrothion is registered for use are established, additional animal metabolism studies may be required. Analytical methodology for determining levels of residues of fenitrothion, fenitrooxon, and p-nitrocresol in plants is adequate for data collection and tolerance enforcement purposes, Storage stability and residue data are required to support the wheat gluten tolerance. A provisional acceptable daily intake (PADI), based on a one-year dog study with a NOEL of 0.125 mg/kg/day and using a 30-fold safety factor is calculated to be 0.004 mg/kg/day. A Theoretical Maximum Residue Contribution (TMRC) for the U.S. population is calculated to be 0.000038 mg/kg/day, which utilizes 0.94 percent of the PADI.

4. Summary of Regulatory Positions and Rationales

° Fenitrothion is not being placed into Special Review at this time. Although the Agency is concerned over the potential adverse impact of fenitrothion on birds and aquatic organisms resulting from the forestry use pattern, comprehensive aquatic and terrestrial field studies are needed in order to evaluate the potential risks to birds and aquatic organisms. The Agency is also requiring submission of special acute and subchronic rat studies to provide additional information to confirm the potential for fenitrothion to cause retinal degeneration and changes in corneal shape and structure in the human eye. Pending receipt and evaluation of these data, labeling modifications or other regulatory action may be warranted.

° The Agency is classifying the forestry uses of fenitrothion (spruce budworm and southern pine beetle) for restricted-use due to avian and aquatic invertebrate hazards on an interim basis pending receipt and evaluation of the

aquatic and terrestrial field studies.

° Fenitrothion is highly toxic to honeybees, aquatic invertebrates, and avian species. Endangered species label restrictions are required to protect endangered and threatened species in forest areas.

° Special indoor air residue monitoring studies are required to support continued use of the 40% wettable powder formulation in homes to control adult Anopheline mosquitoes.

° No new tolerances or new food uses will be granted until the Agency has received data sufficient to evaluate the dietary exposure of fenitrothion.

° The Agency is imposing an interim 24 hour reentry interval for the greenhouse and nursery ornamental use pending receipt and evaluation of reentry data.

° Protective clothing statements are required for all products containing fenitrothion.

6. SUMMARY OF OUTSTANDING DATA REQUIREMENTS

	Time Frame*
Toxicology	
Subchronic oral toxicity--rodent species (for plasma cholinesterase effects)	12 Months
21-day dermal--rabbit	9 "
90-day inhalation--rat	15 "
Oncogenicity--mouse	50 "
Teratogenicity--rat and rabbit	15 "
Reproduction--rat	39 "
Mutagenicity	12 "
Metabolism study	12 "
Special tests--acute and subchronic tests in rats for eye effects	24 "
	9 "
Environmental Fate/Exposure	
Hydrolysis study	9 Months
Photodegradation in water, soil and air	9 "
Aerobic soil metabolism study	27 "
Anaerobic aquatic metabolism study	27 "
Lab volatility study	12 "
Leaching and adsorption/desorption	12 "
Soil dissipation study	27 "
Forestry dissipation study	27 "
Fish accumulation study	12 "
Applicator exposure studies	9 "

* based upon receipt of the Standard by the registrant.

Indoor air/surface residue exposure study	12 "
Reentry Data	27 "

Fish and Wildlife

Avian reproduction	24 Months
Actual field testing--birds and aquatic organisms	48 "
Acute toxicity to freshwater invertebrates--typical end-use product	9 "
Fish early life stage and aquatic invertebrate life cycle	15 "

Plant Testing Requirements

Seed germination/seedling emergence	9 Months
Vegetative vigor	9 "
Aquatic plant growth	9 "

Residue Chemistry

Residue analytical methods	18 Months
Storage stability	18 "
Residue data (wheat gluten)	24 "

Product Chemistry 9-15 Months

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